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ABSTRACT

This is a summary of discussion and materials used in a seminar on Cognitive Style Mapping (CSM) of individual learning strengths as a key to an accountable teacher education program based on personalized instruction. CSM refers to a diagnostic technique used to identify a student's relative learning strengths on selected learning variables. This document describes the coverage of the seminar in the following areas: (1) an overview of CSM as an edumetric procedure, (2) the role of CSM in an accountable model of learning, (3) CSM as a self-screening instrument in professional preparation, (4) reading skill augmentation as an example of the development of basic learning strengths, and (5) the development and validation of a CSM instrument. (Author/RC)

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COGNITIVE STYLE MAPPING:

A SYSTEM FOR PLANNING TRUE PERSONALIZED INSTRUCTION

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The following represents a summary of discussion and materials used in A Specialized Topic Seminar for the 1976 National Association of Teacher Education Conference held in St. Louis, Missouri, February 4, 1976

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ABSTRACT

In this era of educational accountability, no program is more challenged to examine its graduates than teacher education. Professional and financial realities, as well as humanistic goals for student growth, mandate more careful approximations of individualized instruction systems, wherein each student can meet acceptable standards of competency before certification. And yet, even attempts to develop competency-based teacher education programs do not insure accountability at the level of the individual learner.

This Seminar focused on Cognitive Style Mapping (CSM) of individual learning strengths as a key to an accountable teacher education program based on truly personalized instruction. These materials briefly describe the coverage of the Seminar in the following areas: (1) an overview of CSM as an edumetric procedure, (2) the role of CSM in an accountable model of learning, (3) CSM as a self-screening instrument in professional preparation, (4) reading skill augmentation as an example of the development of basic learning strengths, and (5) the development and validation of a CSM instrument. Seminar participants additionally gained experience in interpreting individual student's maps and developing learning programs.

OVERVIEW OF COGNITIVE STYLE MAPPING

Cognitive Style Mapping was developed through the pioneering efforts of Joe Hill and associates as part of the Educational Sciences.[8] CSM refers to a diagnostic technique used to identify a student's relative learning strengths on selected learning variables. The procedure is edumetric rather than psychometric in that it describes a person's growth compared with himself rather than compared with others and is descriptive rather than evaluative orientated. By understanding the learning variables represented on a Cognitive Map, the interrelationships among the variables, and the relationship between the variables and requirements of a learning task, the CSM becomes a highly valuable tool in assisting the learning of an individual.

The CSM identified 27 learning related skills organized in three areas of a person's cognitive style: his encoding and decoding of symbols, the implications of cultural determinants on his preference for learning environments, and the modalities of inferences utilized in his thought processes.[5]

The first set of a CSM describes "Qualitative" and "Theoretical" as the two types of symbols used by learners as they gather data from their environment and encode responses. Qualitative symbols refer to data perceived through sensory stimuli and cultural codes. Theoretical symbols refer to words and numbers and the differential preferences for dealing with such symbols in an oral or written manner is identified.

The second set of a CSM describes the environmental preferences of a learner based on the relative importance of three basic cultural determinants: his own perceptions, his peer group, and his family. These determinants correlate respectively to a desire to work on one's own in one's own way, to work with peers, or to work directly with an authority figure.

The third set includes tendencies to use preferentially the basic thought patterns of Magnitudes, Differences, Relationship, Appraisal, and Deductive thinking. The first four are inductive patterns.

When interpreting a CSM, it is vital to do so in light of the interrelationships of symbols both within sets and between sets to develop a "valid" representation of a person's learning strengths.

The data gained from administering and interpreting a CSM can, and often is, gained by empirical observation of a teacher during the process of getting to know a student. The uniqueness of the Cognitive Mapping procedure is that it provides a significant mass of information about a learner at the beginning of a learning experience. Having this information early enables both adaptation of the learning task to a person's cognitive style and augmentation of that style to facilitate accountable learning for every student.

THE ROLE OF COGNITIVE STYLE MAPPING IN AN ACCOUNTABLE MODEL OF LEARNING.

The term accountability probably has its roots in the area of public finances and refers to the legal and responsible use of public monies by public servants. Implied in the term is the assumption that those who hold stewardship over public monies must accept the consequences of their stewardship and be removed from that position when and if they are irresponsible, incompetent, or dishonest. Quite recently the term has made its way into the realm of education where the original meaning has become somewhat blurred, but the basic element of responsibility for actions taken has been retained.

Initially, educational accountability meant that those responsible for the expenditure of public funds for education were to be held responsible for how the money was spent. Those officials not capable of efficiently using public monies would be replaced. Later, accountability also came to mean that no student could be denied access to public educational facilities. From this desire for equal opportunity as well as financial responsibility came a third development in the use of accountability in education; this is perhaps the logical conclusion of the first two steps. Accountability now came to mean that those involved in the educational process were to achieve greater efficiency and effectiveness in using public funds by redesigning the learning environment to make it more responsive to the students and to public needs. Although few would argue with this application of the term accountability, significant problems have developed in the attempts to achieve this goal.

It is not the purpose of this presentation to discuss all the problems associated with achieving accountability in education but to present a model that might aid in reaching acceptable accountability. The model should include the following. First, the learning goals and objectives of each class, department, and institution must be clearly stated and coherently related into a meaningful whole. Second, the learning environment must be made to tailor-fit each student in an effort to maximize learning; and then the learning environment must be monitored to make sure effective, efficient, learning is occurring. Fourth, support must be given to the instructor and the students so that

various types of hardware, software, and human resources, are available to augment the student's learning skills so that all objectives may be attained. Fifth, through the use of appropriate pre and post tests covering cognitive, affective, and psycho-motor domains, changes in the performances of the students must be determined. Sixth, a cost analysis must be kept so that a comparison can be made between the traditional system of learning and that encompassing a truly personalized system. Only by measuring and comparing individual gains with expenditures will it be possible to determine ways of learning most effective and efficient, and thus accountable in the fullest sense.

A key to the success of this model is the second step, assessing the cognitive style of <u>each</u> student. In the past, many experiments have been tried in an effort to improve the efficiency and effectiveness of student learning. "New" ways of learning have been devised and compared to the traditional way of learning with results seeming to indicate one approach was about as effective as another. The fault in these findings is that the assumption has been made that all students will learn the same way, while research in cognitive style suggests strongly that people are different and have different learning skills and abilities. When the learning environment is appropriately adapted to the individual, learning increases.

A diagnostic instrument to describe the individualities of a student is the CSM. The map provides the key to the mode by identifying both student learning strengths which can be matched to a learning mode for efficient learning, <u>and</u> by identifying those learning variables that need augmentation by careful mismatching with learning modes for full development of an individual's learning. This full development is especially important when we are talking about the student in a teacher education program. In this way various learning options can be effectively utilized in accomplishing accountable learning within a course and toward the overall goals of a degree. Cognitive Style Mapping provides the basis, vehicle, and to some extent through the augmentation process, the objectives inherent in the educational use of the term accountability. Accountability will not occur unless and until the student's individual cognitive style is assessed and then accomodated and strengthened in the learning environment.

COGNITIVE STYLE MAPPING AS A SELF-SCREENING MEASURE IN PROFESSIONAL PREPARATION

Inherent in the model of accountable learning just developed is the identification and use of specific information about a student's learning strengths. One significant potential use of CSM within a teacher preparation program is as a self-screening procedure to (1) suggest learning strengths which could be used as a major vehicle in selecting and fulfilling a person's course of study, and perhaps more importantly, (2) identify those areas in need of augmentation. Used in conjunction with proficiency testing, self-concept inventories and counseling, cognitive mapping may provide a useful tool for self-selection in the professional preparation of teachers. Students probably are best suited for careers that require the use of their performance strengths. Where motivation is high, however, cognitive mapping can be used to suggest specific variables which need augmentation before success as a teacher is likely. It is significant that with the use of CSM, learning variables in need of augmentation can be identified and improved at the beginning of a teacher candidate's professional preparation. In this way schools can avoid graduating marginally-prepared teachers or "screening out" a candidate after an unsuccessful student teaching experience.

Students and counselors can gain a realistic estimate of a student's chances of success in the teaching profession in general and a specific field in particular. The teacher preparation program then has a much sounder basis for entering into the implied contract of accepting a candidate into their program and the student's chances of success are greatly enhanced.

Several specific examples of the relationship of cognitive map variables to teacher preparation are found in the following paragraphs and a reference article:[4]

A prospective teacher low in T(AL) might have trouble listening and talking to students and could be hanpered in conceptualization which is important in achieving higher levels of learning. Being a good consumer of research and being a good scholar are dependent on the high T(VL). A person who is very high in T(VL) but low in T(AL) might be better suited for research than teaching although other learning variables would influence this choice.

Individuals receive accurate or distorted impressions of the outside world depending on the keenness of their senses. For example, someone interested in physical education and coaching would be handicapped by weaknesses in perception. A high Q(A) subtly affects physical performance by corroborating or substituting for vision. A high Q(T) is important in many athletic skills. Fencers practice with their eyes blindfolded and basketball players frequently refer to having a good touch when shooting well. A high Q(V) often is important in performing physical skills effectively and Q(P) would indicate the ability of a student to watch a demonstration and then perform a task.

Qualitative cultural codes would provide clues to effectiveness in performing roles required in teaching. A high degree of empathy permits interaction with different students in different ways. Although it is ideal for a teacher to also possess a high level of self-understanding, sometimes people with personal problems are capable of great sensitivity to others. Students high in Q(CES) would be more successful in educational programs emphasizing esthetics. Students low in Q(CET) might have difficulty keeping up with daily preparations. Students low in Q(CS) may have low self-esteem and a tendency to project personal problems on others; a lack of self-confidence can make others who rely on you insecure. A high Q(CT) is an important asset for a teacher as these skills enable him to influence others and serve as a leader.

An effective teacher must have the ability to shift roles in interpersonal relationships to adapt to the learning needs of students. Therefore, an inadequacy in a person's ability to work with authority, with groups, or to work independently would require augmentation.

The way an individual thinks and makes decisions may provide insights into the way he approaches teaching, as well as his chances of success in a particular academic area. Students with high M's prefer specific directives and requirements. They tend to be strong in science and prefer the use of rules in understanding information. They seem well-suited for teaching courses that emphasize fundamentals. Strong R's like to make connections between new materials and things already learned. They tend to favor the social sciences, and they are adapt at learning concept through examples. High D's prefer alternative ways of approaching

tasks. Students high in D and R are likely to be creative in approaching problems.

It is necessary to examine the interaction of all the student's learning strengths represented on the CSM before using any of the information to guide a choice of career or to serve as the basis for augmentation. This data can, however, provide valuable information in self-screening by teacher preparation candidates in an accountable program.

READING SKILL AUGMENTATION

Most teacher preparation faculties readily acknowledge that a large number of candidates enter their programs deficient in some basic learning skills. The national concern over deficits is felt in every university program. They should be of most compelling concern to those responsible for future teachers. Perhaps a significant key to accountable teacher education programs is the augmentation of deficits or the building of learning strengths. It has been suggested that an optimal CSM for a teacher would of necessity be a highly flexible one with a diversity of skills. Augmentation procedures call into use all available personnel and facilities. Because reading skills T(VL) are essential teacher-related skills, and currently of great national concern, we have focused on this learning variable to illustrate an approach to augmentation.

A fundamental concept of the Educational Sciences is that matching of student learning strengths and learning task requirements leads to effective learning; mismatching (within controlled limits) may lead to augmentation of learning skills. Using data from a student's CSM, instructional programs to augment reading may be developed which match and mismatch learning strengths within and between sets of the Map. While tentative, prescription possibilities may lead to testable hypotheses in augmentation. To begin planning augmentation procedures, the following quote from The Educational Sciences, by Joseph Hill (Oakland Community College Press, page 15) seems most useful:[7]

> The construct of cognitive style is a vehicle which can be used to diagnose individuals and prescribe

> activities that provide the high probability of the student's accomplishing successfully the educational task confronting him. It should be noted that the cognitive style of an individual is a relative concept, and depends not only upon the educational level and cultural background of the individual, but on the symbolic conditions of the task to be accomplished.

Two messages seem most specific in the above quotation. The educator must diagnose and prescribe for success, and cognitive style is a relative concept. Both of these messages may create some paradoxes for reading instruction. Diagnosis implies the detection of weakness but success in learning requires that strengths be utilized. High preference for attaining meaning through reading does not necessarily imply high reading skill; rarely does it imply high capability or efficiency in gaining meaning by reading content from more than a few disciplines at adult levels.

Measures of reading to verify a Theoretical Visual Linguistic (T(VL)) Symbolic Orientation and place it in some context relative to educational attainment, may require careful interpretation. Diagnosticians in reading commonly think of skills of learning to read, and of skills of reading to learn. Survey and achievement tests at college levels usually imply an investigation of skills for reading to learn. If results are to be worthy of prescription time, the diagnostician must consider the physical condition of the student, the content of the test, the response requirements, and then carefully observe or investigate reading behaviors in non-test situations. Finally they must compare the implications of the test results to requirements of non-test reading assignments and non-test reading behaviors before writing prescriptions. This is the context verification of a T(VL) strength or deficit and the context for prescribing augmentation.

On the following three pages are prescription possibilities, some of which suggest augmentation possibilities. The first of these concerns itself with Cultural Determinants or the personal preference the learner indicates with regard to the people in his environment who influence the meaning associated with symbols of the environment. No reference to reading is made. The writer's assumptions are that the

learner has certain preferences as to whom he will turn for modeling, reinforcement, or assistance in reading; all factors of a learner's map may influence reading; finally, reading must be idiosyncratic and thus highly independent but nevertheless learned from and affectively conditioned by others in an environment.

The second page of prescription options deals with Symbolic Orientations and for T(VL) augmentation. Methods and procedures in teaching reading would commonly be thought of as processes. While inextricably involved and concomitant with processes, methods described by teachers place heavy emphasis on things used. The things used may be used within a pattern of prescribed behaviors, but the properties stimulating reading suggest the possibility of matching properties with Symbolic Orientations. Symbolic preferences from cognitive style maps may indicate what properties and procedures to choose for instruction.

Since no methods, approaches, or procedures known to the writer include careful analysis of the Modalities of Inference required of a reader, the final page of prescription possibilities is tentatively provided. Matching the learner's mapped preferences, and the teacher's analysis of materials, may lessen the gap of dissonance between a given author's presentation and the learner's thinking processes. Conversely, a slight dissonance between an author's thinking and a learner's thinking might augment a weakness in an inference area.

The following three pages are devoted to prescription possibilities.

CULTURAL DETERMINANTS

And some QUALITATIVE SYMBOLIC ORIENTATIONS closely related to person aspects.[5]

(PRESCRIPTION POSSIBILITIES)

CROSS AGE TUTORING

(IDEAL) Learner High F with Tutor High F
(POSSIBLE): 1. F augmentation for low F learner
2. Certain sessions may augment a learner low in Q(CET)

(IDEAL) Learner High A with Tutor High A
(POSSIBLE): 1. Augment low Q(CEM)
2. Augment low Q(CS)
3. Augment low Q(CH)
4. Augment low Q(CK)

PEER TUTORING

(IDEAL) Tutor High A with Learner High A
(POSSIBLE): 1. Augment low A
2. Augment low Q(CT)
3. Certain sessions may augment low Q(CET)

SMALL GROUP (PEER) SEMINAR

(IDEAL) Learners High A
(POSSIBLE): 1. Augment low A of one member if peers will help.
2. Augment low Q(CT)
3. Augment low Q(CEM)
4. Some groups can influence the augmentation of a low Q(CET)
5. May influence needs of low Q(CK)

INDEPENDENT STUDY

(IDEAL) Learner High I
(POSSIBLE): 1. Short session for I augmentation.
2. Q(CET)augmentation in short session.

TEACHER-SMALL GROUP

(IDEAL) Teacher Presents for High F
(POSSIBLE): 1. Augment low F
2. Augment low Q(CET)
3. Augment low Q(CEM)

(IDEAL, Teacher Presents for High A
(POSSIBLE): 1. Augment for low A
2. Augment for low Q(CET)
3. Augment for low Q(CH)
4. Augment for low Q(CP)
5. Augment for low Q(CS)
6. Augment for low Q(CT)
7. Augment for low Q(CK)

TEACHER-LARGE GROUP

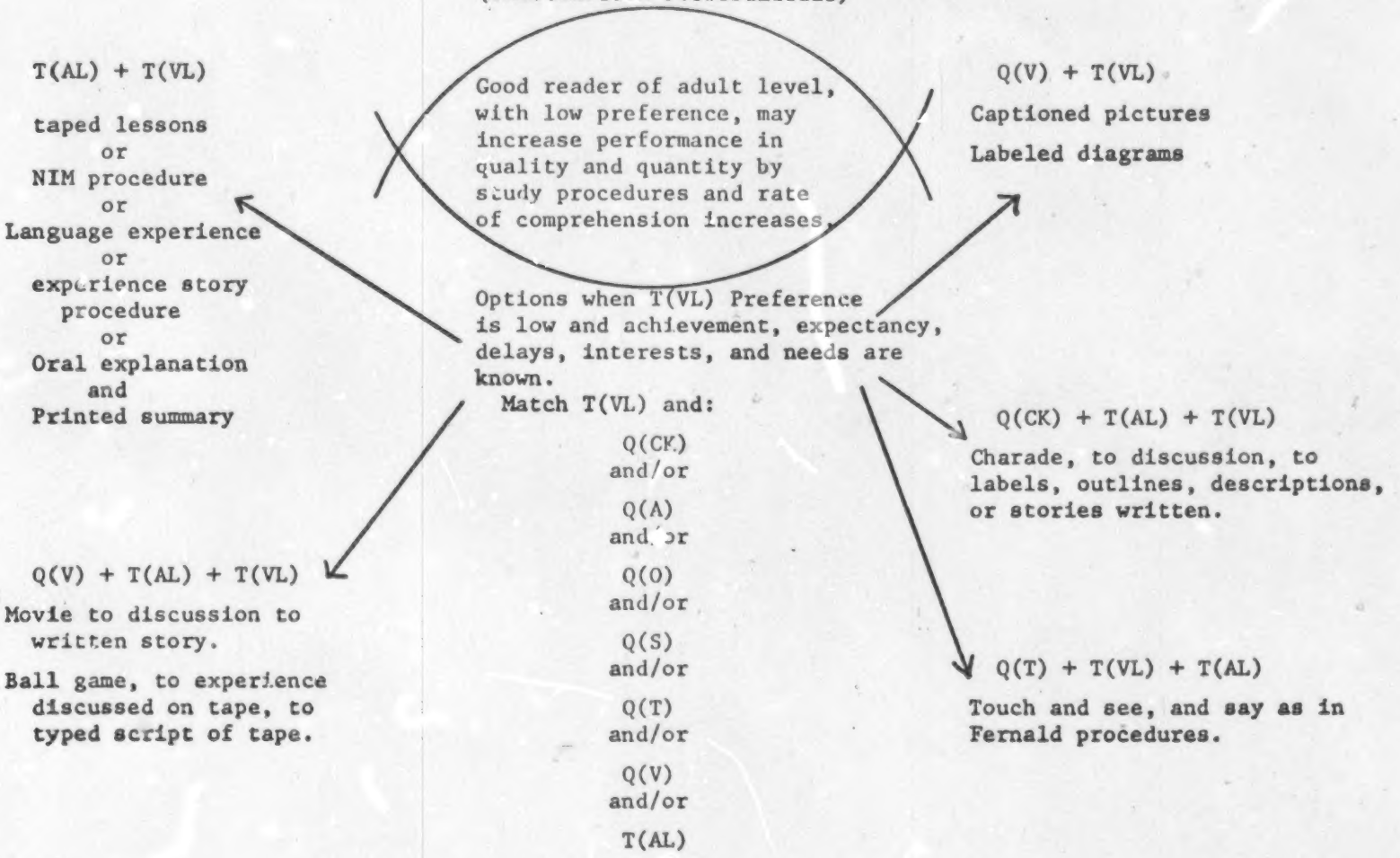
(IDEAL) Learner High F
(POSSIBLE): 1. Augment low F in short session.
2. Augmentation for low Q(CET)

(IDEAL) Learner High Q(CK)

SYMBOLIC ORIENTATIONS

AUGMENTING OR CIRCUMVENTING LOW SKILL OR LOW PREFERENCE IN READING[5]

(PRESCRIPTION POSSIBILITIES)


Good reader of adult level, with low preference, may increase performance in quality and quantity by study procedures and rate of comprehension increases.
Options when T(VL) Preference is low and achievement, expectancy, delays, interests, and needs are known.
Match T(VL) and:
Q(CK) and/or
Q(A) and/or
Q(O) and/or
Q(S) and/or
Q(T) and/or
Q(V) and/or
T(AL)
With brief reading carefully guided.
T(AL) + T(VL)
taped lessons or NIM procedure or Language experience or experience story procedure or Oral explanation and Printed summary
Q(V) + T(VL)
Captioned pictures
Labeled diagrams
Q(V) + T(AL) + T(VL)
Movie to discussion to written story.
Ball game, to experience discussed on tape, to typed script of tape.
Q(CK) + T(AL) + T(VL)
Charade, to discussion, to labels, outlines, descriptions, or stories written.
Q(T) + T(VL) + T(AL)
Touch and see, and say as in Fernald procedures.

MODALITIES OF INFERENCE

HIGHLY INVOLVED READERS-LISTENERS MAY REQUIRE CSM MATCHING. MISMATCH FOR AUGMENTATION[5]

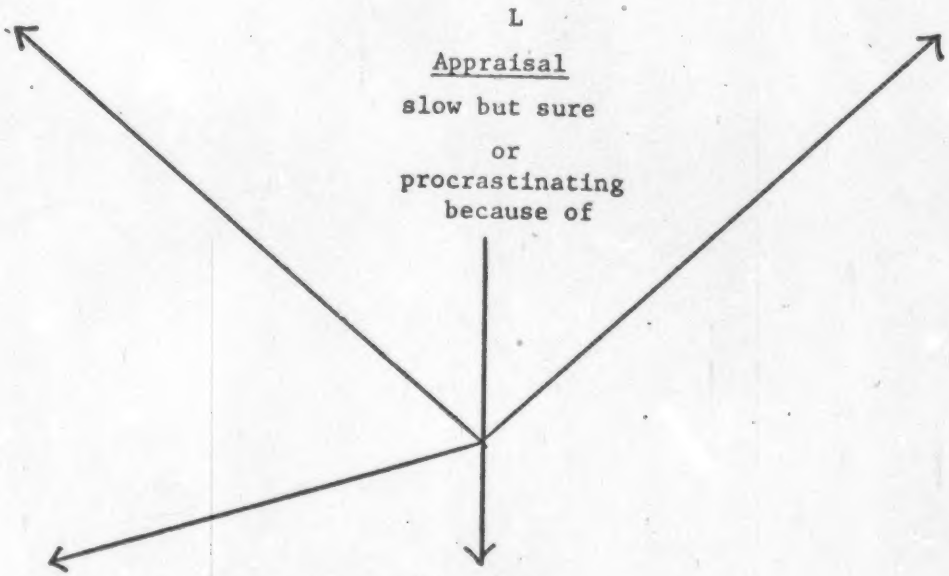
(PRESCRIPTION POSSIBILITIES)

T(AL) or T(VL)
using M patterns

definitions
outlines
directions
rules
procedures
steps
succinctness

T(AL) or T(VL)
using R patterns

classes
categories
samples
connections
cause/effect
similarities
elaboration



T(AL) or T(VL)
using D patterns

contrast
alternative
not
uniqueness
contradiction
diversity
creative/argumentative

T(AL) or T(VL)
using (K) patterns

laws
formulas
exactness
syllogism
proof
conclusiveness
certainty

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DEVELOPMENT OF A COGNITIVE STYLE MAP INSTRUMENT

The Cognitive Style Map instrument in most common use is a self-report inventory. This format has been found to be a highly efficient means of gathering data on the basic 27 learning variables considered in student cognitive style. The CSM was originally developed utilizing direct skill testing. People's behavior was recorded in planned situation and on nationally-normed instruments such as the Nelson-Denny Reading Test. Building from this original validated map, a Q-sort instrument was developed using items which correlated highly with the direct skill measures. Finally, the items in the Q-sort were used to make up the self report inventory: the assumption being that people frequently do what they do well and avoid doing what they do poorly.

Because the CSM is an edumetric instrument rather than psychometric and requires sensitivity to the specific population it is intended for, the instrument should be adapted to fit a local population and normed for that population. To facilitate such adaptation, basic procedures used at Northeast Missouri State University are briefly outlined.

The CSM instrument used at NMSU was modified from the Oakland Community College form. Those items oriented toward the older ages of community college students, or urban living were changed in content to relate to late teenagers or rural living. For example, an item which originally was, "I enjoy taking children to a zoo or library." was changed to "I enjoy taking children to a fair."

The reliability and validity of the CSM instrument was investigated considering the instrument as an edumetric test.[1,2,3] Psychometric tests measure individual differences in relationship to a group and are reliable and valid in terms of how they reflect the consistencies between individual differences. Such tests are also labeled "norm-referenced." Edumetric tests are designed to measure the gain or growth of an individual's knowledge, learning skills, or abilities, and are concerned with differences within an individual. To serve as a reference point for within-individual growth a study with speech communication students (n=71) was conducted during the

Fall semester of 1974.[6] Gains in skill tests related to the speech communication course were compared with attendant changes in the CSM instrument to indicate edumetric validity. These speech communication skill tests were competency-based power tests with the criterion of 100% attainment of objectives. For example, T(AL) was tested by each student listening to a five minute video-taped message without taking notes and then correctly answering all of the following: the communicator's purpose, three main points, and five factual or inferential questions about the message.

In terms of assessing reliability and validity, a correlation of .235(df=69) was significant at the $p < .05$ level. The KR-20 and split-half reliability coefficients were computed assessing the elements edumetrically. Twenty of the 27 KR-20 correlations were significant at the $p < .05$ level and 22 of the 27 split-half reliability coefficients were significant at the same level.

Regarding internal validity over 94% of the CSM items were significant at the $p < .05$ level and all of the elements of the CSM were significant at the same level. Five elements were studied in terms of external validity comparing the speech communication skill tests with attendant changes in the CSM. Two of the five had external validity coefficients significant at the $p < .05$ level. The modified CSM instrument was determined to be very reliable and some evidence for edumetric validity was found.

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